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VIII.—*Notes on the Reproduction of the Campanulariadae; with a description of a new species of Laomedea.* By the Rev. THOMAS HINCKS, B.A.

[With a Plate.]

To the Editors of the Annals of Natural History.

GENTLEMEN,

IN the present state of our knowledge respecting the reproduction of the Campanularian Zoophytes, it is not undesirable that the observations of as many independent inquirers as possible should be recorded, and material be thus accumulated, which may aid the physiologist in his attempts to solve the many difficult questions connected with it.

Every observer possessed of tolerable accuracy and patience, and placed in favourable circumstances, may be able to contribute some facts previously unnoted, or at least to afford valuable confirmation of results already announced.

Some of the reproductive phenomena amongst the *Campanulariadae* would seem to be of comparatively rare occurrence. It is but seldom, perhaps, that one individual is privileged to witness the entire series, and his researches, however carefully conducted, will require to be supplemented by those of others, who have had the opportunity of reading a different chapter of the wonderful history.

The observations of Dalyell and Van Beneden would give us an imperfect view of the subject, if unaccompanied by those of Lovén and others. It is through the cooperation of many naturalists, carrying on their investigations at different seasons and under different local circumstances, that we must hope to arrive

at a *complete* knowledge of this interesting department of physiology. While there are still many points altogether undetermined, and many more respecting which greater certainty is desirable, every contribution of accurate observation, however humble, has a certain value. It is with this conviction that I have prepared the following notes, embodying the observations which I have been able to make on some of the British *Campanulariadae*.

CAMPANULARIA SYRINGA.

The polype of this pretty species is furnished with sixteen tentacula, or even more. It is very slender and graceful, and protrudes far beyond the mouth of the cell.

The conical *operculum* is composed of many pieces. These give way to allow of egress, and close as soon as the body of the polype is withdrawn.

The vesicles are oval, mounted on a very short stalk with one or two rings. I am unable to say whether they are of rare occurrence; but they are not described by either Dr. Johnston or Sir J. G. Dalyell.

Towards the close of April I obtained a specimen of the *Campanularia* parasitical on *Sertularia argentea*, on which the vesicles occurred in great profusion. They presented a very remarkable appearance. Each vesicle was surmounted by a spherical body containing an opaque nucleus, which occupied nearly the whole of its interior (Pl. III. fig. 1). The vesicle itself was traversed by a central column, which widened as it approached the top and expanded into a somewhat roundish mass immediately below the orifice. Occasionally one was met with in an earlier stage of development. Here the external sac with its contained ovum was wanting, and the vesicle exhibited the appearance represented in Pl. III. fig. 2. The column extended only about half way up the vesicle, and terminated in an oval body containing granular matter, and freely supplied by the nutrient stream which pervaded the entire zoophyte. This was evidently an "ovigerous bud" in process of formation. In by far the greater number of cases, however, the ova-bearing bodies had passed beyond the mouth of the vesicle and were attached to the top of it.

I was not fortunate enough to see any of the ova in the act of escaping, but one was found in the watch-glass which had evidently just emerged from its prison-house. It was circular, opaque white, and set round with very fine *cilia*. Subsequently I noticed one of the sacs with a rent or opening in its side, towards which the ovum seemed to be working its way.

By compressing some of the vesicles between glass, and then examining them with the microscope, the details of their struc-

ture were readily determined. They will be understood by a reference to Pl. III. fig. 3.

The column (*a*) which traverses the centre of the vesicle is a membranous tube containing granular matter,—a prolongation of the animal substance which permeates the creeping stem. Through this flows the stream of nutrient particles. Immediately below the orifice it expands into a kind of pouch (*b*), which in the living state is filled with granular matter. When emptied of its contents, it appears as a delicate membranous sac within the vesicle. A kind of neck (*c*) connects this with the mouth of the vesicle and the external ovigerous body (*d*). In the centre of the latter is a distinct cavity (*e*) within which the ovum is contained. The external envelope (*f*) is of varying, often of considerable, thickness. From the lower part of the central cavity a canal (*g*) passes downward and opens into the granular mass (*b*). The lower extremity of the ovum, which is somewhat produced, just penetrates this canal at *h*, and through this channel and at this point the nutrient stream finds entrance to the ovum. Such is the structure of the vesicle.

The following is a summary of the results obtained with respect to the propagation of *Campanularia Syringa*:—

1. At certain seasons oval vesicles are produced in great abundance on the creeping fibre, into which an offshoot from the common animal substance penetrates,—a membranous tube containing granular matter.

2. After a time this offshoot expands at the top into an oval body, in which granular substance accumulates, and through which the nutrient stream circulates.

3. This body gradually enlarges, and at length passes beyond the mouth of the vesicle, where it remains attached, receiving supplies of the nutrient fluid through a canal which descends from its lower extremity.

4. In the course of its development a portion of the granular substance is aggregated into a central nucleus separated from the rest of the structure and lying in a distinct cavity. Nourished by the general circulation this is matured into a perfect ovum, which at length escapes through the ruptured walls of the containing sac.

The ovigerous body must increase considerably,—probably undergoes most of its development after passing beyond the mouth of the vesicle, for it is often met with of such a size that it could not be contained within.

With respect to the membranous pouch inclosing granular matter, which always occurs immediately below the orifice, it is no doubt the early stage of an ovigerous body destined to suc-

ceed the external one when it has discharged its contents and withered away. I have never seen more than one such in the same vesicle.

The mode of reproduction which I have described is very different from that which is commonly met with amongst the *Campanulariadae*. No Medusoids were seen to issue from the vesicles of *Campanularia Syringa*. Nor do the ovigerous bodies which surmounted them resemble those described and figured by Iister and Lovén as occurring on certain species of *Laomedea*; for the latter assumed a true Medusan form, and tentacles were developed at the upper extremity.

The vesicles of *C. Syringa*, on the contrary, bear a very close resemblance to those which occur at times on *Sertularia argentea* and others of the same genus, and which have been well described by Sir J. G. Dalyell as "compound vesicles." In the case of the *Sertularia*, it would appear from the observations of this naturalist, that the ovigerous body is sometimes completely developed within the vesicle, and does not pass beyond it; and so it may be at times with the *Campanularia*, though I have not met with such a case.

Taking into consideration the facts presented by the joint history of the *Sertularia* and *Campanularia in connexion with this mode of propagation*, it appears that the ovigerous body is a spherical expansion (bud) of the offshoot from the common animal substance, which penetrates the vesicle, within which the ovum (or ova) is developed in a distinct central cavity, to which the nutrient stream has free access; that the development is sometimes perfected within the vesicle, when (in the case of the *Sertularia*) the *Planula* escapes through the orifice; while at others the ovigerous body passes beyond the case and remains attached to it externally, still maintaining its connexion with the central tube, until the ciliated ovum or *Planula* has reached maturity and has liberated itself.

There is a perfect analogy between the *Campanularia* and *Sertularia* in respect to this method of propagation. To show the close resemblance of the compound vesicle of *Sertularia argentea* to that of *C. Syringa*, as just described, I have copied Sir J. G. Dalyell's figure of the former (Pl. III. fig. 4). The relation of this mode of reproduction to that by free Medusoids I have not been able to determine.

CAMPANULARIA VOLUBILIS.

Whilst examining specimens of *C. volubilis*, procured in February, my attention was attracted by one or two very minute Medusæ which were jerking themselves about in the watch-glass containing the zoophyte. At first I observed only one, but sub-

sequently two more made their appearance, and I could have little doubt that they were the progeny of the *Campanularia*. The zoophyte was covered with vesicles containing Medusoids in various stages of development. One was observed working its way slowly towards the orifice by means of the characteristic jerk. It was furnished with curled arms resembling those of the free Medusa in the watch-glass, and though I could not determine its shape with accuracy, I have no doubt of the identity of the two.

The Medusa was an exquisite little creature, about the one-fortieth of an inch in height, of graceful form and the purest transparency. Its presence was indicated to the naked eye by five opake white dots marking the four arms and the peduncle. Its perfectly translucent umbrella could only be detected by the aid of the microscope. My specimens only lived for two or three days. During that period they were tolerably active, and jerked themselves about in Medusa-fashion with some rapidity.

The following is a description of the Medusoid (Pl. III. fig. 5). *Umbrella* globose or subconic, a little depressed at the top, perfectly transparent; a membranous veil round its inner margin. *Tentacles* four, curling, muricate, colourless, springing from a somewhat triangular tubercle. Between each pair of arms on the margin there are three tubercles, the central one the largest; the two smaller ones have each a little circle or ocellus towards the upper end. *Radiating vessels* four, very distinct, running to the four tentacles. *Subumbrella* somewhat conic. *Peduncle* short, swollen towards the base, with a narrow neck, and expanding slightly towards the mouth. No colour could be detected on any portion of the body. The arms were generally curled up in three coils, but occasionally were unrolled. Height $\frac{1}{40}$ th of an inch.

I have seldom met with a lovelier being than this fairy-like Medusa. In some points it reminded me of the *Modeeria* figured in Professor Forbes's 'Monograph on the Naked-eyed Medusæ.'

The *Campanularia* was infested by a strange crustacean (?) parasite. I observed one which had made its way *within* a cell, and attached itself to the body of the polype. Afterwards it emerged and fastened upon one of the tentacles.

LAOMEDEA GENICULATA and GELATINOSA.

The bell-shaped progeny of *L. geniculata* have nearly thirty tentacles. There is a prominent ocellus at the base of every other arm. The Medusoids are excluded in very different stages of development; some small, with the arms stunted; others much larger, with the arms of considerable length. The Medusoids of the *Laomedea gelatinosa* I have always found with sixteen arms.

In other respects they resemble those of *L. geniculata*. Each vesicle contains about five of them.

NEW SPECIES OF LAOMEDEA.

Dr. Johnston describes and figures a species of *Campanularia* under the name of *C. lacerata*. I have lately had the opportunity of ascertaining that this is only the early state of a *Laomedea* which has occurred to me in considerable abundance on the Devonshire coast, and which is as yet, I believe, undescribed. It may be thus characterized:—

LAOMEDEA LACERATA (Hincks). (Pl. III. fig. 6.) *Stem filiform, ringed throughout; cells on short pedicles, ovato-conical, the upper portion divided into a number of deep convergent segments.*

This is the smallest of the British *Laomedea* and is of extreme delicacy. The largest specimen which I have met with does not exceed the sixteenth of an inch in height.

The stems, which are slender and slightly ringed throughout, rise from a creeping fibre and bear the cells on short pedicles, composed of four or five rings, and somewhat irregularly disposed. The cells are ovate, the upper part conical and cleft into a number of deep segments, which converge and form an acute apex. The polype when issuing pushes aside the pieces, which close again upon its retreat. They form an admirable operculum to the cell.

In its young state this *Laomedea* is identical with the *Campanularia lacerata* of Dr. Johnston's work. Single cells are frequently met with, supported on short ringed pedicles, which spring immediately from the creeping fibre, as represented in Plate III. fig. 6 x.

Laomedea lacerata was obtained abundantly in tufts of *Bowerbankia*, and on weed, at Exmouth.

I remain, Gentlemen, your obedient servant,

THOMAS HINCKS.

Exeter.

P.S.—In a paper entitled "Notes on British Zoophytes," which was published in the 'Annals' for November 1851, I described a species of *Farrella* as new, under the name of *F. producta*. Since that time Mr. Wyville Thomson has directed my attention to Van Beneden's figure and description of *Laguncula elongata*, which I had not previously seen, and I have now no doubt of the identity of the two species.

The name *F. producta* must therefore be cancelled, and I would substitute for my former note under this heading, a record of the occurrence of the *Laguncula elongata* of Van Beneden (*Farrella elongata* it should be) as a British species.

EXPLANATION OF PLATE III.

- Fig. 1. Vesicle of *Campanularia Syringa*.
 — 2. The same in an earlier stage.
 — 3. The same, highly magnified, to show the details of structure.
 — 4. "Compound vesicle" of *Sertularia argentea* from Sir J. G. Dalzell.
 — 5 a. Medusoid of *Campanularia volubilis*. b. Two of the tentacles and the intermediate tubercles. c. A tentacle and its bulb.
 — 6. *Laomedea lacerata* (highly magnified). w. The same in the young state.

IX.—Contributions to the Palæontology of the Isle of Wight.

By THOMAS WRIGHT, M.D. &c.*

IT has been supposed that the tertiary beds of England, when compared with those of the continent of Europe, are deficient in mammalian remains; this opinion, like many other hasty generalizations, if it be not entirely fallacious, requires modification. The valuable series of mammalian remains obtained from time to time from the lacustrine strata of Kyson, Hordwell, and the Isle of Wight, lead us to believe that if similar facilities existed in these localities for working the beds from whence mammalian bones and teeth are obtained, as is the case in the neighbourhood of Paris, the richness of the English tertiaries in these remains would no longer be a doubtful question. We have been led to this conclusion from facts which have come under our observation during the two consecutive summers we were engaged in drawing up a description of the coast sections of Hampshire and the Isle of Wight, and which have already appeared in the pages of this Journal. Until last summer no remains of the new genus *Dichodon* had been found, except in one spot in the Hordwell section, when I had the good fortune to discover, near Alum Point, Isle of Wight, a portion of the lower jaw of this singular genus with the true molars "in situ" in beautiful preservation. This jaw fortunately supplies some points in the anatomy of this rare mammal, which were absent in the only specimen hitherto found, and which it is the object of this note to furnish.

Dichodon cuspidatus, Owen.

The dental formula of the lower jaw of *Dichodon cuspidatus*, according to Professor Owen, consists of three incisors, one canine, four premolars, and three true molars, arranged in a continuous series in each ramus, and it is inferred that these were

* Read at Cheltenham at a Meeting of the Cotteswold Naturalists' Club, May 4, 1852.